The First Twenty-Five Winners of the AWM Alice T. Schafer Prize

Joseph A. Gallian

> *It is a wonderful honor to be awarded the Alice T. Schafer Prize from the Association for Women in Mathematics. I would like to thank those who established the award for their vision to recognize and encourage young women mathematicians. Mathematics, though extremely rewarding, is a difficult career to pursue, and thus it is so important for young mathematicians to feel support from the community as they pursue their careers. I want to thank the Association for Women in Mathematics for showing me such support and recognizing me among such outstanding young women mathematicians.*
>
> —Melanie Matchett Wood, 2002 Co-winner

The Origins

The Alice T. Schafer Mathematics Prize For Excellence in Mathematics by an Undergraduate Woman was established in 1990 by the executive committee of the Association for Women in Mathematics (AWM) and is named for its second president and one of its founding members, Alice T. Schafer, who oversaw the incorporation of the AWM and championed opportunities for women in mathematics throughout her career. She retired as the Helen Day Gould Professor of Mathematics at Wellesley College in 1980. Schafer's honors include being elected a Fellow of the American Association for the Advancement of Science in 1985 and receiving the MAA Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics in 1998. Schafer died in 2009.

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Schafer Prize nominees must be either US citizens or have a school address in the United States and be an undergraduate when nominated. The award is presented at the AWM Reception at the Joint Mathematics Meetings (JMM) each January and at the JMM Awards Presentation. Recipients receive a $1000 prize, an honorary plaque, and are featured in an article in the AWM newsletter. The charge to the three-person AWM selection committee is, "To recognize talented young women to be evaluated on the ability for independent work in mathematics, demonstration of real interest in mathematics, quality of performance in advanced mathematics courses and special programs, and (when relevant) performance in mathematical competitions at the local or national level." To encourage multiple worthy nominees, each year there are one or two winners, up to two named runners-up, and up to three named honorable mentions.

In this article we provide a brief overview of the career paths of the first twenty-five Schafer Prize winners.

The Winners

1990: Linda Green (co-winner) is a teaching assistant professor of mathematics at University of North Carolina at Chapel Hill. She obtained a bachelor's degree from the University of Chicago and a PhD at Princeton in 1996 under Cynthia Louise Curtis. Her research interests include math and statistics education, mathematical modeling of disease, and topology and geometry of three-dimensional manifolds. She has published seven papers in medical journals. In 2018 she received the UNC Goodman–Petersen Award for Excellence in Teaching.

1990: Elizabeth Wilmer (co-winner) is a professor of mathematics and former department head at Oberlin College.

She received a bachelor's degree from Harvard and a PhD from Harvard in 1999 under Persi Diaconis. Wilmer is a coauthor of the 2008 AMS book *Markov Chains and Mixing Times* and has published five papers in combinatorics and probability.

1991: Jeanne Nielsen Clelland is a professor of mathematics at the University of Colorado at Boulder. She received her bachelor's degree from Duke and PhD from Duke in 1996 under Robert Bryant. Her research area is differential geometry and its applications to differential equations. In 2018 she received the Burton W. Jones Distinguished Teaching Award from the Rocky Mountain Section of the MAA. Clelland has published more than twenty papers.

1992: Zvezdelina E. Stankova was a professor of mathematics at Mills College for sixteen years and is currently teaching mathematics at Berkeley. She received a bachelor's degree from Bryn Mawr and a PhD from Harvard in 1997 under Joe Harris. She has published seven papers in enumerative combinatorics that have been cited more than 250 times and is coeditor of two books on problem solving. Stankova is founder of the Berkeley Math Circle, an inaugural winner of the MAA Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member in 2004, and the recipient of the MAA Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics in 2011.

Figure 1. Cathy O'Neil.

1993: Cathy O'Neil is an author and data science consultant. She received her bachelor's degree from Berkeley and a PhD from Harvard in 1999 under Barry Mazur. Following five years as a math postdoc at MIT, she took a position at Barnard College. From 2007–2011 she worked in the finance industry. A PBS *Frontline* episode about Wall Street featured a 38-minute interview with her. She is the author of the blog mathbabe.org and was a TED talk speaker in 2017 (see [1]). O'Neil's book *Weapons of Math Destruction* was long-listed for the 2016 National Book Award for Nonfiction. At the 2019 Joint Math Meetings she received the MAA's Euler Book Prize and gave the MAA-AMS-SIAM Porter Public Lecture.

1993: Dana Pascovici is a biostatistician at the Australian Proteome Analysis Facility at Macquarie University, where she focuses on generating reliable methods of interpreting and analyzing data on plasma proteomics and plant proteomics. She received a bachelor's degree from Dartmouth and a PhD from MIT in 2000 under David Vogan. Pascovici was the first recipient of the Elizabeth Lowell Putnam Prize for a high score in the Putnam Competition, finishing sixteenth out of 2,356 participants.

1994: Jing Rebecca Li is a research scientist at Institut National de Recherche en Informatique et en Automatique in France. She received her bachelor's degree from Michigan and PhD degree from MIT in 2000 under Jacob White. Li has published more than twenty-five papers in applied math and physics journals.

1995: Ruth Britto-Pacumio (now Britto) is an associate professor in theoretical physics at Trinity College Dublin. She earned a bachelor's degree in mathematics from MIT and a PhD in physics from Harvard in 2002. She has held research positions at the Institute for Advanced Study, the University of Amsterdam, the Fermi National Accelerator Laboratory, and the Commissariat à l'énergie atomique. Britto is best known for her work on scattering amplitudes in high-energy collider experiments designed for discovering and analyzing new particles and new physical behaviors. Her 2005 paper with Cachazo, Feng, and Witten, which provided a recursion method for calculating scattering amplitudes, has been cited more than 1,100 times. She coauthored two other papers in 2005 which have been cited more than 1,600 times. Britto has also published six papers on black holes. She was the second winner of the Elizabeth Lowell Putnam Prize.

1996: Ioana Dumitriu is a professor of mathematics at the University of Washington at Seattle. In September 2019 she will join the math department at UC San Diego as a professor. Her research interests include the theory of random matrices, numerical analysis, and scientific computing. She received her bachelor's degree from NYU and a PhD from MIT in 2003 under Alan Edelman. She was the first woman Putnam Fellow (top five) and is a Fellow of the American Mathematical Society. Dumitriu has received the Leslie Fox Prize for Numerical Analysis, an NSF CAREER Award, and won the Elizabeth Lowell Putnam Prize three times. She is the author of twenty-five published papers.

1997: No award given due to calendar change.

1998: Sharon Ann Lozano Gretencord (co-winner) received her bachelor's degree from the University of Texas in 1998 and a master of science in computational and applied mathematics from Texas in 2000. She then spent two years as a lecturer in the mathematics department at UT while developing math and science curricula for a non-profit. Since then Gretencord has been home-schooling her six children.

1998: Jessica Shepherd Purcell (co-winner) is an associate professor of mathematics at Monash University in Australia. She received her bachelor's degree from the University of Utah and a PhD in 2004 from Stanford under Steven Kerckhoff. She has published thirty-nine papers on low-dimensional topology and has given more than seventy-five invited talks. Purcell has received an NSF CAREER Award and a Sloan Research Fellowship.

1999: Caroline J. Klivans is an associate professor of applied mathematics at Brown University. She received a bachelor's degree from Cornell and a PhD from MIT in 2003 under Richard Stanley. Klivans has published more than twenty papers in combinatorics.

2000: Mariana E. Campbell Levin is an assistant professor of mathematics, specializing in mathematics education, at Western Michigan University. Her research concerns how people think about and learn mathematics with the goal of fostering meaningful learning experiences and broad participation in mathematics. She received a bachelor's degree from the UC San Diego, a PhD in math education from Berkeley in 2011 under Alan Schoenfeld, and had a postdoctoral research position in the Program in Mathematics Education (PRIME) at Michigan State University. Levin has a book in press titled *Conceptual and Procedural Knowledge During Strategy Construction: A Complex Knowledge Systems Perspective*.

2001: Jaclyn Kohles Anderson received a bachelor's degree from the University of Nebraska and a PhD from Wisconsin in 2006 under Ken Ono. After finishing her PhD, she raised two children while working on mathematics as time permitted. Recently, Anderson has returned to school to study operations research and data science. She has published four papers in number theory and one in discrete dynamical systems.

2002: Kay Kirkpatrick (co-winner) is Blackwell Scholar in Mathematics and an associate professor of mathematics and physics at the University of Illinois at Urbana–Champaign. She received a bachelor's degree from Montana State and a PhD from Berkeley in 2007 under Fraydoun Rezakhanlou. Her research interests include statistical mechanics, PDEs, condensed matter physics, and biological computation. Kirkpatrick was an NSF Postdoctoral Fellow

Figure 2. Melanie Matchett Wood.

at MIT from 2007–2009. She has received an NSF CAREER Award, given more than thirty-five invited talks, and published eight articles in math and physics journals.

2002: Melanie Matchett Wood (co-winner) is the Vilas Distinguished Achievement Professor of Mathematics at the University of Wisconsin at Madison. In September 2019 she will join the Berkeley math department as a Chancellor's Professor. She received a bachelor's degree from Duke and a PhD from Princeton in 2009 under Manjul Bhargava. Wood was the first American woman to be a Putnam Fellow and the first woman to win the AMS-MAA-SIAM Frank and Brennie Morgan Prize for Outstanding Research by an Undergraduate Student. Her many awards include AMS Fellow, NSF CAREER Award, AWM-Microsoft Research Prize, an American Institute of Mathematics Five-Year Fellowship, a Sloan Research Fellowship, and a Packard Fellowship. The website "The Best Schools" has her on the list "The Top 50 Women in STEM." She has published more than thirty-five papers in number theory and given more than 100 invited talks.

2003: Kate Gruher Mattison is vice president of curriculum at IXL Learning, an American educational technology company whose website offers educational practice for K–12 students. Mattison leads the content design team that creates interactive, engaging, challenging practice skills for math, English language arts, science, social studies, and Spanish. She received a bachelor's degree from Chicago and a PhD from Stanford in 2007 under Ralph Cohen.

2004: Kimberly Spears Hopkins is the owner of a real estate investment company specializing in industrial multitenant buildings. She received a bachelor's degree from UC Santa Barbara and a PhD in 2010 from Texas under Fernando Rodriguez-Villegas.

2005: Melody Chan is an assistant professor at Brown University. She received a bachelor's degree in computer science and mathematics from Yale and a PhD from Berkeley in 2012 under Bernd Sturmfels. From 2012 to 2015 she was an NSF Postdoctoral Fellow and Lecturer in the mathematics department at Harvard. Her research interests are combinatorial algebraic geometry, graph theory, and tropical geometry. From 2000–2001 Chan studied the violin at the Juilliard School with Itzhak Perlman and Dorothy DeLay. She has more than twenty publications, more than 500 citations, and has given more than ninety invited talks. She is a Sloan Research Fellow.

2006: Alexandra Ovetsky Fradkin is the dean of mathematics, science, and technology at the Main Line Classical Academy, an elementary school in Bryn Mawr, where she develops their math curriculum and teaches children in grades K–5. After receiving her 2006 bachelor's degree and a 2011 PhD in mathematics from Princeton under Maria Chudnovsky, Fradkin worked for several years as a professional mathematician publishing ten papers in combinatorics. Before her present position she taught enrichment math at the Golden Key Russian School to children ages 4–10. In 2017 she published *Funville Adventures*, a math-inspired children's fantasy adventure that introduces kids to the concept of mathematical functions.
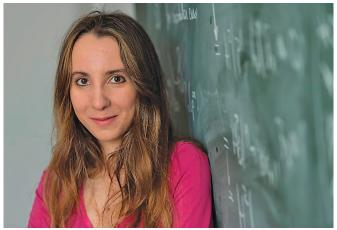

Figure 3. Ana Caraiani.

2007: Ana Caraiani is a Royal Society University Research Fellow and senior lecturer in mathematics at Imperial College London. She received a bachelor's degree at Princeton where her senior thesis advisor was Andrew Wiles. She was a two-time Putnam Fellow and a member of the first place 2006 Putnam Competition Team, the only year Princeton has ever won the team competition. She won the William Lowell Putnam Fellowship for Graduate Study at Harvard, where she received a PhD in 2012 under Richard Taylor. Her research interests include the Langlands program, algebraic number theory, arithmetic geometry, and representation theory. Caraiani was an L. E. Dickson Instructor and NSF Postdoctoral Fellow at Chicago (2012–2013), a Veblen Research Instructor and NSF Postdoctoral Fellow at Princeton University and the Institute for Advanced Study (2013–2016), and a Bonn Junior Fellow at the Hausdorff Center for Mathematics (2016–2017). She has received the Whitehead Prize given by the London Mathematical Society. Caraiani has nine published papers with three running more than one hundred pages and has given more than one hundred invited talks. A paper she coauthored with nine other authors posted on arXiv in December 2018 ran 193 pages. The website "The Best Schools" has her on a list of "The Top 50 Women in STEM."

2008: Galyna Dobrovolska (co-winner) is an NSF Postdoctoral Fellow in mathematics at Columbia University. She obtained her bachelor's degree at MIT and a PhD from Chicago in 2014 under Roman Bezrukavnikov and Victor Ginzburg. In 2015–2016 she was a postdoc at the Max Planck Institute for Mathematics in Bonn. Dobrovolska's research interests lie in geometric representation theory and related areas of algebra, geometry, and combinatorics. She has published six papers.

2008: Alison Miller (co-winner) is a Benjamin Peirce Fellow and NSF Postdoctoral Fellow in mathematics at Harvard with research interests in algebraic number theory, arithmetic invariant theory, and their connections with classical knot invariants. She received a bachelor's degree from Harvard and a PhD degree from Princeton in 2014 under Manjul Bhargava. She is a three-time winner of the Elizabeth Lowell Putnam Prize finishing in the top fifteen each time. In 2018 Miller received a Harvard Excellence in Teaching Award. She has four published papers. The website "The Best Schools" has her on a list of "The Top 50 Women in STEM."

2009: Maria Monks Gillespie is an NSF Postdoctoral Fellow and a Krener Assistant Professor of Mathematics at UC Davis. In September 2019 she will be an assistant professor at Colorado State. She received a bachelor's degree from MIT and a PhD in 2016 from UC Berkeley under Mark Haiman. She is a winner of the Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student, a Churchill Scholar, a Hertz Fellow, and an NSF Graduate Research Fellow. Gillespie's research interests lie in algebraic combinatorics. She has eight published papers and has given more than thirty invited lectures.

2010: Hannah Alpert (co-winner) is a Zassenhaus Assistant Professor of Mathematics at Ohio State University and an NSF Postdoctoral Fellow. She received a bachelor's degree from Chicago and PhD from MIT in 2016 under Larry Guth.

In 2016–2017 she was a postdoctoral fellow at the Institute for Computational and Experimental Research in Mathematics (ICERM) at Brown University. Alpert has published eleven papers in geometric topology and combinatorics.

2010: Charmaine Sia (co-winner) is clinical assistant professor of mathematics at NYU. She received her bachelor's in mathematics and physics from MIT and a PhD from Harvard in 2015 under Michael Hopkins. Sia's research interests include algebraic topology, homotopy theory, the theory of topological modular forms, structured ring spectra, and forms of K-theory. Prior to joining NYU, Sia was the Zorn Postdoctoral Fellow in the department of mathematics at Indiana University Bloomington. She has published five papers.

Comments

Eighteen of the first twenty-five Schafer Prize winners received the award as a senior. Remarkably, Pascovici and Dumitriu won as sophomores. All winners profiled here participated in an REU-like summer program and did original research. All but one winner earned a PhD. Five schools have had multiple Schafer Prize winners: MIT (4), Chicago (3), Duke (2), Harvard (2), and Princeton (2). Five schools have had more than one Schafer Prize winner who obtained a PhD degree at their institution: Harvard (6), MIT (5), Berkeley (4), Princeton (4), and Stanford (2). The criterion "quality of performance in advanced mathematics courses" gives a decided advantage to students from PhD granting institutions. All of the winners profiled here were from such schools. Five women from non-PhD granting institutions received runner-up designation. The highly positive reaction in the math community to the Schafer Prize motivated the MAA to establish the Morgan Prize in 1995 with the AMS and SIAM joining as cosponsors.

It is important to note that the Schafer Prize honors more than just the women selected. It recognizes the mentors, the departments, and the research programs that provide support, nurturing, guidance, and inspiration. The following response from 2002 co-winner Kay Kirkpatrick at the AWM reception for award winners typifies the appreciation they have for those who provide support.

> *I feel extremely honored to be numbered among today's rising women in math. The Association for Women in Mathematics is doing a wonderful thing to encourage and support aspiring mathematicians. I'll spend the rest of my life repaying this debt to AWM and to all of my professors and mentors. You all have not only supported me, but also have been true inspirations.*

References

1. http://www.ted.com/talks/cathy_o_neil_the_era_of_blind_faith_in_big_data_must_end?language=en

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Credits

Photo of Cathy O'Neil is by Adam Morganstern.
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